# STM32-P107 development board
# User's manual

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Rev. G, December 2013
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# INTRODUCTION

STM32-P107 prototype board provides easy way for developing and prototyping with the new STM32F107VCT6 connectivity line microcontroller, produced by STMicroelectronics. STM32-P107 has JTAG port for programming and debugging, USB_OTG, user button, two status LEDs, and most of the GPIOs are on extension headers where you can connect your additional circuits.

# BOARD FEATURES

- CPU: STM32F107VCT6 32 bit ARM-based microcontroller with 256 KB Flash, 64 KB RAM, USB OTG, Ethernet, 10 timers, 2 CANs, 2 ADCs, 14 communication interfaces
- JTAG connector with ARM 2x10 pin layout for programming/debugging
- USB_OTG connector
- USB_HOST connector
- 100Mbit Ethernet
- RS232
- Mini SD/MMC card connector
- UEXT connector
- Power jack
- Two user buttons
- RESET button and circuit
- Two status LEDs
- Power-on LED
- 3V battery connector
- Extension port connectors for many of microcontrollers pins
- PCB: FR-4, 1.5 mm (0,062"), soldermask, silkscreen component print
- Dimensions: 132.08x96.52mm (5.2x3.8")

# ELECTROSTATIC WARNING

The STM32-P107 board is shipped in protective anti-static packaging. The board must not be subject to high electrostatic potentials. General practice for working with static sensitive devices should be applied when working with this board.

# BOARD USE REQUIREMENTS

Cables: The cable you will need depends on the programmer/debugger you use. If you use ARM-JTAG, you will need LPT cable, if you use ARM-USB-OCD, ARM-USB-OCD-H, ARM-USB-TINY, or ARM-USB-TINY-H you will need 1.8 meter USB A-B cable, for ARM-USB-OCD and ARM-USB-OCD-H you will need RS232 cable, too.

Hardware: Programmer/Debugger – one of the Olimex ARM Programmers: ARM-JTAG, ARM-JTAG-EW, ARM-USB-OCD, ARM-USB-OCD-H, ARM-USB-OCD-TINY, ARM-USB-OCD-H.

Note that Olimex OpenOCD debuggers lack SWD interface by default. There is the adapter ARM-JTAG-SWD that adds SWD to any of the programmers/debuggers mentioned above.

Additionally you can use our ARM-JTAG-COOCOX debugger which has both JTAG and SWD interfaces and works with CooCox IDE natively and with IAR EW and Keil uVision via pluggins.

Software: ARM C compiler

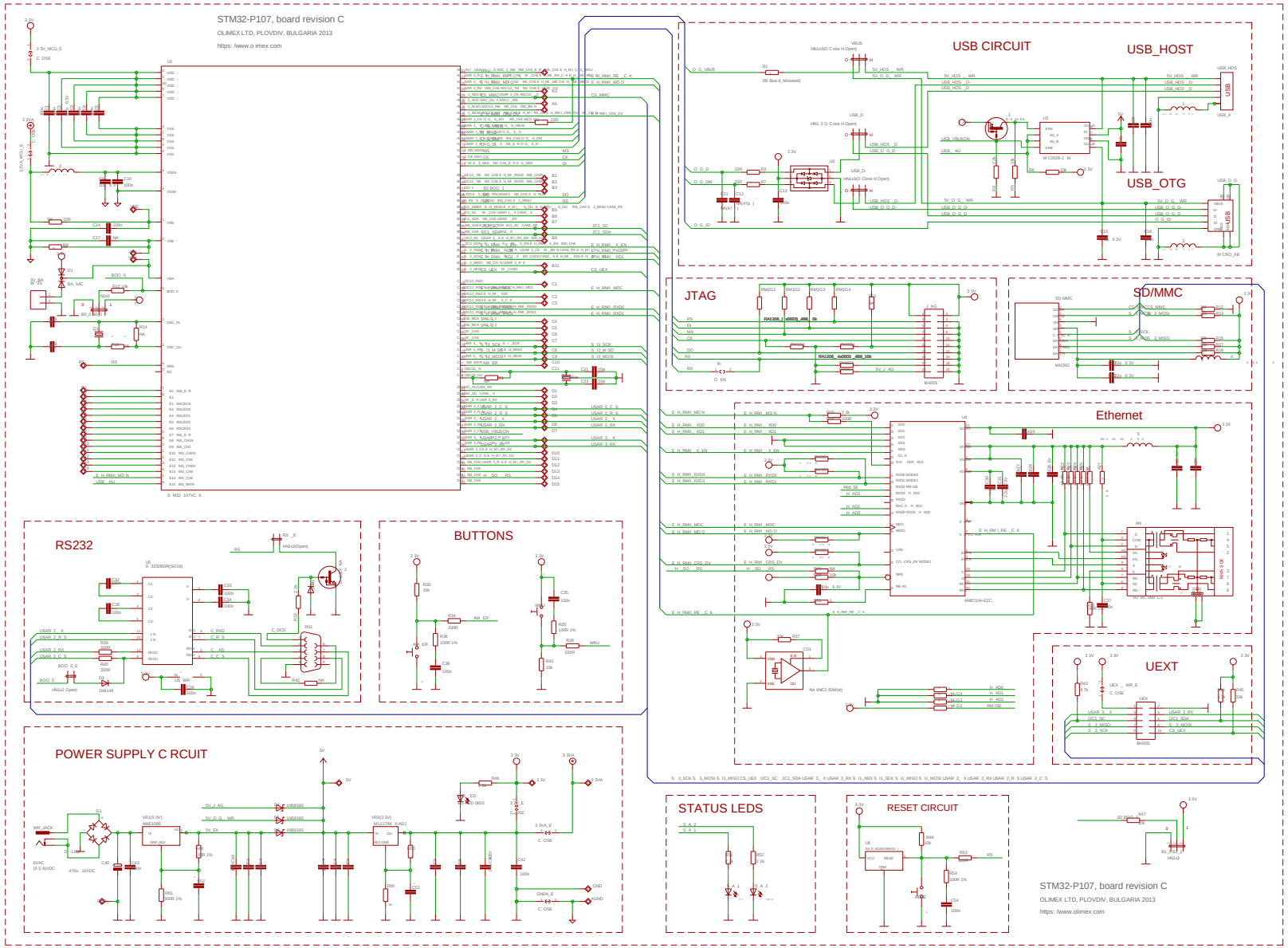
# PROCESSOR FEATURES

STM32-P107 board uses the ARM-based 32-bit microcontroller STM32F107VCT6 with the following features:

- Core: ARM 32-bit Cortex™-M3 CPU
  - 72 MHz maximum frequency, 1.25 DMIPS/MHz (Dhrystone 2.1) performance at 0 wait state memory access
  - Single-cycle multiplication and hardware division
- Memories
  - 256 Kbytes of Flash memory
  - 64 Kbytes of SRAM
- Clock, reset and supply management
  - 2.0 to 3.6 V application supply and I/Os
  - POR, PDR, and programmable voltage detector (PVD)
  - 25 MHz crystal oscillator
  - Internal 8 MHz factory-trimmed RC
  - Internal 40 kHz RC with calibration
  - 32 kHz oscillator for RTC with calibration
- Low power
  - Sleep, Stop and Standby modes
  - VBAT supply for RTC and backup registers
- 2 × 12-bit, 1 µs A/D converters (16 channels)
  - Conversion range: 0 to 3.6 V
  - Sample and hold capability
  - Temperature sensor
  - up to 2 MSps in interleaved mode
- 2 × 12-bit D/A converters
- DMA: 12-channel DMA controller
  - Supported peripherals: timers, ADCs, DAC, $I^2S$s, SPIs, $I^2C$s and USARTs

- Debug mode
  - Serial wire debug (SWD) & JTAG interfaces
  - Cortex-M3 Embedded Trace Macrocell™
- 80 fast I/O ports
  - 80 I/Os, all mappable on 16 external interrupt vectors and almost all 5 V-tolerant
- 10 timers
  - four 16-bit timers, each with up to 4 IC/OC/PWM or pulse counter and quadrature (incremental) encoder input
  - 1 × 16-bit motor control PWM timer with dead-time generation and emergency stop
  - 2 × watchdog timers (Independent and Window)
  - SysTick timer: a 24-bit downcounter
  - 2 × 16-bit basic timers to drive the DAC
- 14 communication interfaces
  - 2 × $I^2C$ interfaces (SMBus/PMBus)
  - 5 USARTs (ISO 7816 interface, LIN, IrDA capability, modem control)
  - 3 SPIs (18 Mbit/s), 2 with a multiplexed $I^2S$ interface that offers audio class accuracy via advanced PLL schemes
  - 2 × CAN interfaces (2.0B Active) with 512 bytes of dedicated SRAM
  - USB 2.0 full-speed device/host/OTG controller with on-chip PHY that supports HNP/SRP/ID with 1.25 Kbytes of dedicated SRAM
  - 10/100 Ethernet MAC with dedicated DMA and SRAM (4 Kbytes): IEEE1588 hardware support, MII/RMII available on all packages
- CRC calculation unit, 96-bit unique ID

# SCHEMATIC


STM32-P107, board revision C
OLIMEX LTD, PLOVDIV, BULGARIA 2013
https: /www.o imex com
USB CIRCUIT
USB_HOST
USB_OTG
JTAG
SD/MMC
Ethernet
RS232
BUTTONS
UEXT
POWER SUPPLY C RCUIT
STATUS LEDS
RESET CIRCUIT
STM32-P107, board revision C
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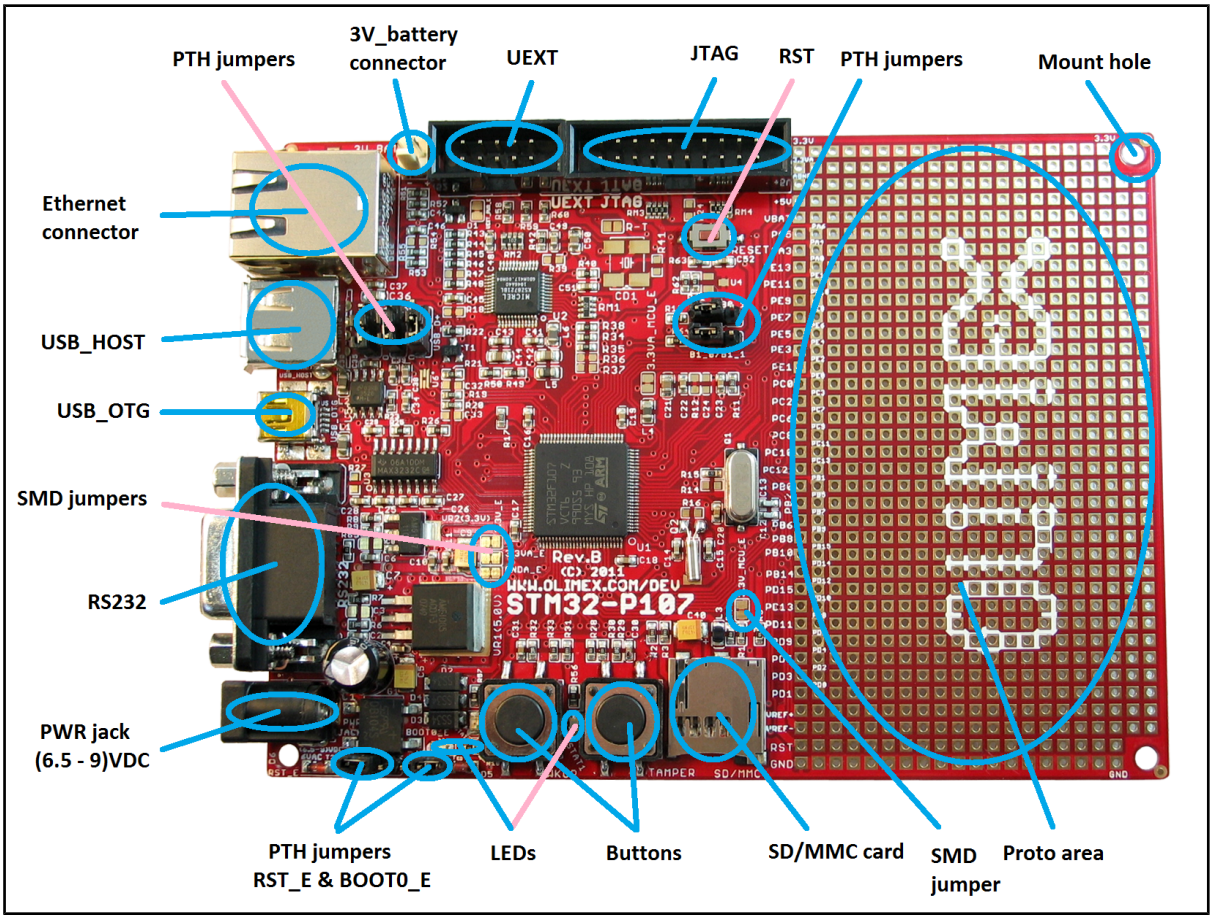
# BOARD LAYOUT




# POWER SUPPLY CIRCUIT

STM32-P107 can take power from three sources:

- PWR connector where (6.5-9)V DC or 6V AC is applied by external power source.
- +5V_ OTG-PWR from USB OTG
- +5V_JTAG from JTAG

The programmed board power consumption is about 70 mA.

# RESET CIRCUIT

STM32-P107 reset circuit includes JTAG connector pin 15, U2 (STE101P) pin 28 (RESET), R73(10k), R74(330Ohm), R75(100Ohm/1%), C55(100nF), STM32F107 pin 14 (NRST) and RESET button.

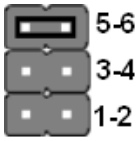
# CLOCK CIRCUIT

Quartz crystal 25 MHz is connected to **STM32F107** pin 12 (OSC_IN) and pin 13 (OSC_OUT).

Quartz crystal 32.768kHz is connected to **STM32F107** pin 8 (PC14/OSC32_IN) and pin 9 (PC15/OSC32_OUT).

# JUMPER DESCRIPTION

**PWR_SEL**




When position 1-2 is shorted – the board is power supplied from JTAG.
When position 3-4 is shorted – the board is power supplied from USB_OTG.
When position 5-6 is shorted – the board is power supplied from External power source.
Default state is – position 5-6 – shorted.

**B0_0/B0_1**

When this jumper is in position B0_1 – BOOT0 is connected to 3.3V, and when the jumper is in position B0_0 – BOOT0 is connected to GND.
Default state is B0_0.

**B1_0/B1_1**

When this jumper is in position B1_1 – BOOT1 is connected to 3.3V, and when the jumper is in position B1_0 – BOOT1 is connected to GND.
Default state is B1_0.

**VBUS**

When is in position “H” - connects +5V_HOST_PWR to OTG_VBUS.
When is in position “O” - connects +5V_OTG_PWR to OTG_VBUS.
Default state is “O”.

**USB_D+**

When is in position “H” - connects USB_HOST_D+ to OTG_DP.
When is in position “O” - connects USB_OTG_D+ to OTG_DP.
Default state is “O”.

**USB_D-**

When is in position “H” - connects USD_HOST_D- to OTG_DM.
When is in position “O” - connects USB_OTG_D- to OTG_DM.
Default state is “O”.

**PWDW_D**

When is closed – disables Ethernet transceiver (STE101P) Power Down Mode. STE101P is active.
Default state is closed.

**3.3V_MCU_E**

Enable microcontroller 3.3V power supply
Default state is closed.

**3.3V_E**

Enable regulator VR2 (3.3V) - LM1117
Default state is closed.

**3.3VA_E**

Enables board 3.3V analog power supply.
Default state is closed.

**3.3VA_MCU_E**

Enables microcontroller 3.3V analog power supply.
Default state is closed.

**GNDA_E**

Enables board analog GND.
Default state is closed.

**R-T**

Connects RST to TRST
Default state is open.

**RST_E, BOOT_E jumpers**

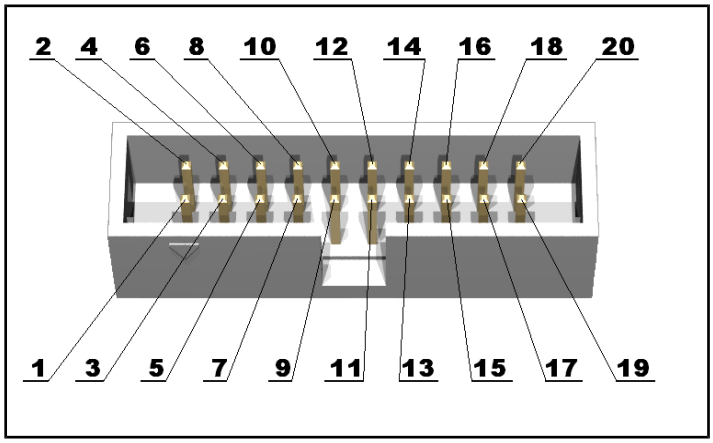
Note that it is recommended to move those jumpers together – either both should be open or both should be closed.
When both are closed RS232 boot is enabled.
Default states are RST_E – open; BOOT_E – open.

# INPUT/OUTPUT

**Status LED1 (green)** with name **STAT1** connected to STM32F107 pin 63 (PC6/I2S2_MCK/TIM3_CH1).
**Status LED2 (yellow)** with name **STAT2** connected to STM32F107 pin 64 (PC7/I2S3_MCK/TIM3_CH2).
**Power-on LED (red)** with name **PWR** – this led shows that +3.3V is applied to the board.
**User button** with name **WKUP** connected to STM32F107 pin 23 (PA0/WKUP).
User button with name TAMPER connected to STM32F107 pin 7 (PC13/TAMPER-RTC).
**Reset button** with name **RESET** connected to STM32F107 pin 14 (NRST).

# CONNECTOR DESCRIPTIONS

## JTAG

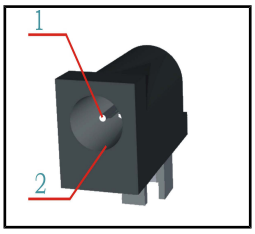



The JTAG connector allows the software debugger to talk via a JTAG (Joint Test Action Group) port directly to the core. Instructions may be inserted and executed by the core thus allowing STM32F107 memory to be programmed with code and executed step by step by the host software.
For more details please refer to IEEE Standard 1149.1 - 1990 Standard Test Access Port and Boundary Scan Architecture and STM32F107 datasheets and users manual.

| Pin # | Signal name | Pin # | Signal name |
|---|---|---|---|
| 1 | 3.3V | 2 | 3.3V |
| 3 | TRST | 4 | GND |
| 5 | TDI | 6 | GND |
| 7 | TMS | 8 | GND |
| 9 | TCK | 10 | GND |
| 11 | PULL-DOWN | 12 | GND |
| 13 | TDO | 14 | GND |
| 15 | RST | 16 | GND |
| 17 | PULL-DOWN | 18 | GND |
| 19 | +5V_JTAG | 20 | GND |

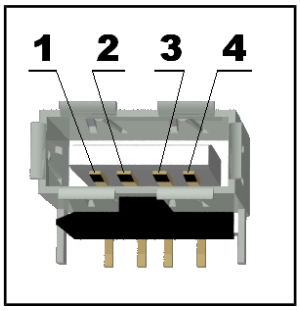
## PWR_JACK

| Pin # | Signal name |
|---|---|
| 1 | Power input |
| 2 | GND |



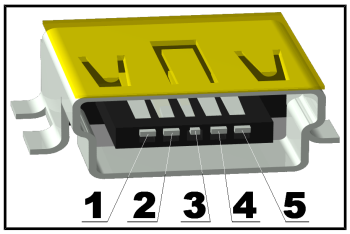

## USB_HOST

| Pin # | Signal name |
|---|---|
| 1 | +5V_HOST_PWR |
| 2 | USB_HOST_D- |
| 3 | USB_HOST_D+ |
| 4 | GND |



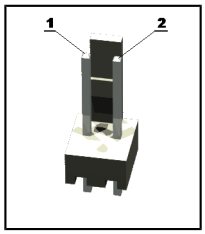

## USB_OTG

| Pin # | Signal name |
|---|---|
| 1 | +5V_OTG_PWR |
| 2 | USB_OTG_D- |
| 3 | USB_OTG_D+ |
| 4 | OTG_ID |
| 5 | GND |




## 3V_BAT

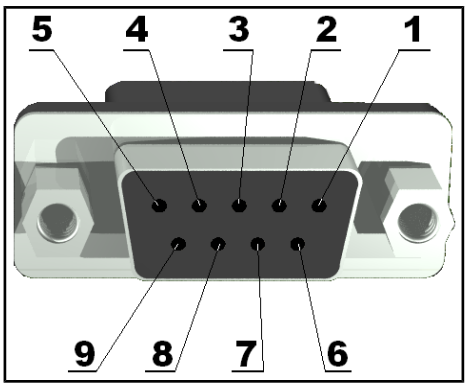
| Pin # | Signal name |
|---|---|
| 1 | VBAT |
| 2 | GND |



## RS232

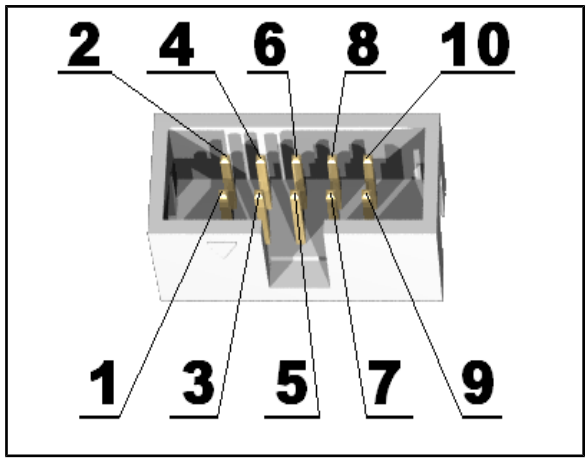
The RS232 port can be used for communication when in bootloader mode. To enter bootloader mode you need to close RST_E and BOOT0_E jumpers. Note that the default position of those jumpers is closed, e.g. bootloader mode disabled.

| Pin # | Signal name |
|---|---|
| 1 | NC |
| 2 | T1OUT |
| 3 | R1IN |
| 4 | NC |
| 5 | GND |
| 6 | NC |
| 7 | CTS |
| 8 | RTS |
| 9 | NC |

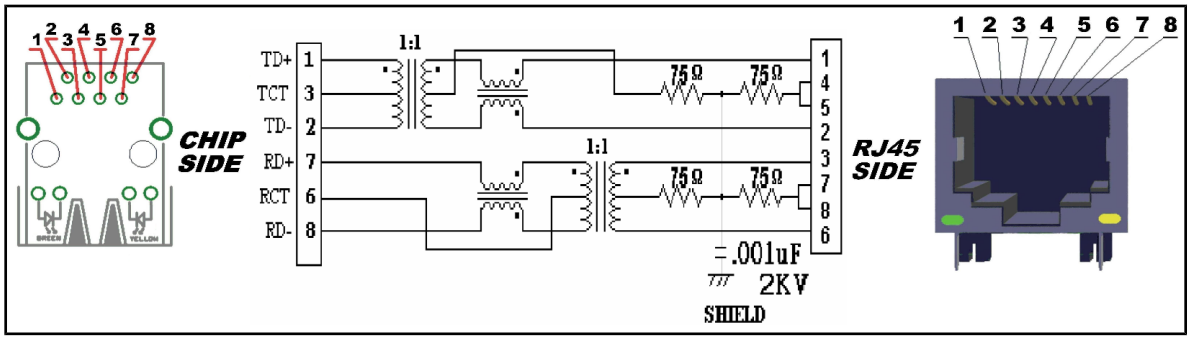



## UEXT

| Pin # | Signal name |
|---|---|
| 1 | 3.3V |
| 2 | GND |
| 3 | USART2_TX |
| 4 | USART2_RX |
| 5 | I2C1_SCL |
| 6 | I2C1_SDA |
| 7 | SPI3_MISO |
| 8 | SPI3_MOSI |
| 9 | SPI3_SCK |
| 10 | CS_UEXT |



# LAN

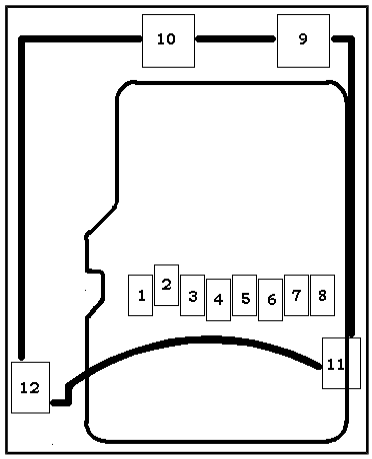



| Pin # | Signal name chip side | Pin # | Signal name chip side |
|---|---|---|---|
| 1 | TX+ | 5 | Not connected (NC) |
| 2 | TX- | 6 | VDD |
| 3 | VDD | 7 | RX+ |
| 4 | Not connected (NC) | 8 | RX- |

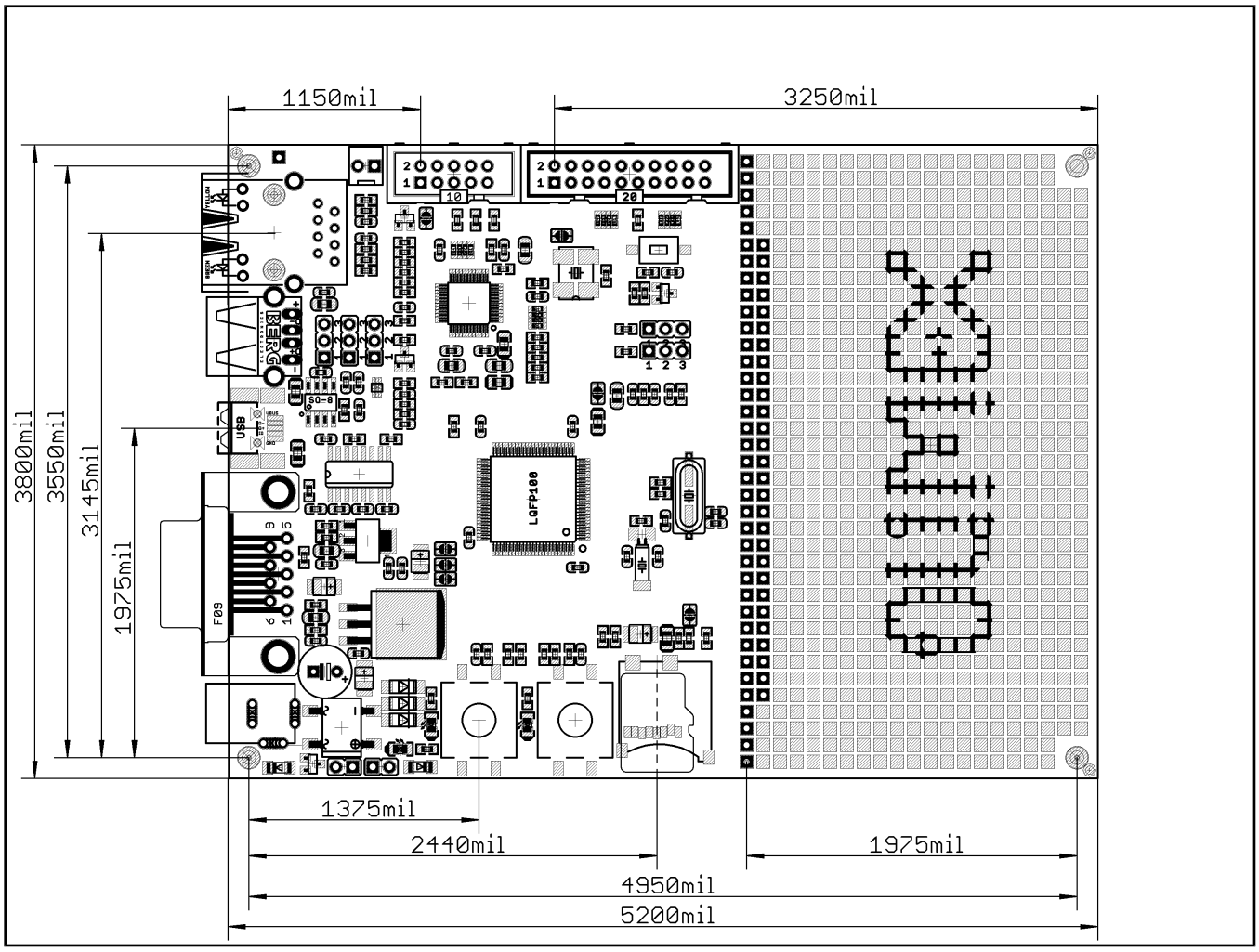
| LED | Color | Usage |
|---|---|---|
| Right | Green | Link status |
| Left | Yellow | Activity status |

# SD/MMC

| Pin # | Signal name |
|---|---|
| 1 | MCIDAT2 |
| 2 | CS_MMC |
| 3 | SPI3_MOSI |
| 4 | 3.3V |
| 5 | SPI3_SCK |
| 6 | GND |
| 7 | SPI3_MISO |
| 8 | MCIDAT1 |
| 9 | Not connected |
| 10 | Not connected |
| 11 | Not connected |
| 12 | Not connected |



# MECHANICAL DIMENSIONS




All measures are in mils.

# AVAILABLE DEMO SOFTWARE

All demo examples are available at the board's web-page (https://www.olimex.com/Products/ARM/ST/STM32-P107/) and wiki article (https://www.olimex.com/wiki/STM32-P107). Make sure that the demo you download is compatible with the board revision you have! The board revision is printed on STM32-P107 itself.

# REVISION AND ORDERING INFORMATION

**STM32-P107** – fully assembled and tested

## Manual revision history:

| | |
|---|---|
| REV. I | - created December 2009 |
| REV. A | - edited by TU December 2010 |
| REV. B | - demo software added and mechanical dimensions detaile |
| REV. C | - rev. A schematic and added more programmers in BOARD USE REQUIREMENTS. |
| REV. D | - edited June 2011 – changed schematic |
| REV. E | - changed schematics to rev. B, added board revision history |
| REV. F | - added BOOT0_E, RST_E description, changed dimensions, updated revision B pictures, updated disclaimer |
| REV.G | - updated the information to fit board revision C, updated schematics, improved document layout, added product support information, updated links |

## Board revision history:

rev. A
========
1. ST2052BD is exchanged with LM3526-L.
2. SD/MMC signals are changed as follows:
SPI1_MOSI -> SPI3_MOSI
SPI1_SCK -> SPI3_SCK
SPI1_MISO -> SPI3_MISO
and SPI1_NSS renamed to CS_MMC
3. Changed the polarity to + of C36

rev. B
========
1. All element libraries are now updated
2. Ethernet PHY is changed from STE101P to MICREL's one - KS8721BLMM
3. All 10uF/6.3V/TANT are changed to 0805 and a lot of element names are changed.
4. PWR_SEL jumpers are replaced by diodes.
5. USART3 is connected to UEXT while USART2 is connected to RS232 and bootloader functionality is enabled! Two additional jumpers are added!!!
6. Added UEXT_PWR_E jumper!
7. A lot jumpers are added into jumpers description table

rev. C
========
1. L2 is now placed further from USB_HOST connector to avoid contact
2. Ethernet PHY Micrel KS8721 is changed to LAN8710A-EZC in RMII
3. Changed C18 from 100n to 4.7uF/6.3V according to the datasheet. C18 is now renamed C3.
4. STAT1, STAT2 and PWR_LED were changed to 0603 and its resistors to 2.2k.
5. SD/MMC capacitor was replaced by 2x22uF/6.3V capacitors.
6. LM3526 was exchanged with MIC2026-1YM and connection between pin 1 and pin4 was swapped because the default EN level is opposite.
7. All tantalum capacitors are changed to ceramic.
8. Optimizations in the values of few other elements as well.
9. R28(0R) was changed to 10k, C55=10uF/6.3V was added and RST connection was removed from the PHY!